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Challenges and Opportunities Shaping the Future of Pharmacy Practice

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The pharmacist profession has evolved substantially over recent decades, transitioning from a profession primarily focused on medicine dispensing to one increasingly centred on patient care, public health, and interprofessional collaboration. The day-to-day work needs to integrate clinical and social perspectives in patient care (1), and patients cannot be approached only as biomedical cases to whom pharmacists dispense medication (2). Being positioned as one of the more accessible and trusted professionals within healthcare systems, they are crucial in drug therapy management and overall better health outcomes (3). In a rapidly evolving landscape, professional identity, organizational structures, workplace culture, environmental responsibility, and technological innovation present both significant challenges and important opportunities for the pharmacy profession's evolution.

Professional identity formation represents an important dimension of pharmacy practice. Academic preparation requires not only scientific knowledge but also the cultivation of the values, behaviours, and professional responsibilities that shape professional identity. However, rather than being acquired solely through formal education, professional identity develops continuously through workplace experiences, mentorship, patient interactions, and reflective practice and is not experienced equally by all practitioners (4). Evidence demonstrates that gender, race, ethnicity, and other structural inequalities influence how pharmacists negotiate their professional roles, often requiring individuals from underrepresented groups to overcome additional barriers to establish their professional identity (5). These findings reinforce the need for educational institutions and healthcare organizations to promote inclusive learning environments, equitable career opportunities, and professional well-being.

In addition, community and hospital pharmacists frequently work under conditions characterised by low job satisfaction, increasing prescription volumes, and workforce shortages, especially in low- and middle-income countries, that reduce opportunities to deliver comprehensive patient-centred care (6–8). The World Health Organization (WHO) recognizes excessive workload as an important contributor to medication safety incidents (9). Earlier research similarly has demonstrated that increasing prescription volume is associated with higher dispensing error rates (10), while inefficient workflow contributes to occupational stress and reduced job satisfaction among pharmacists (8). Improving workflow should therefore be considered a patient safety intervention rather than merely an operational objective. Delegating appropriate technical responsibilities to trained pharmacy technicians, implementing appointment-based services, and establishing structured learning systems for medication errors may simultaneously improve healthcare quality and pharmacists' professional satisfaction.

These challenges occur alongside a growing demand for healthcare services and an ongoing

evolution of pharmacy practice. As populations age and the burden of chronic disease increases, pharmacists are increasingly expected to contribute beyond the traditional role of dispensing medicines. In many healthcare systems, they are actively involved in medication reviews, medication therapy management, chronic disease monitoring, vaccination services, health promotion, medication adherence support, point-of-care testing, and, in some countries, prescribing medicines within collaborative or independent practice models (11–14). However, the implementation of these new services should be accompanied by financial and organizational incentives (15). More recent evidence suggests that fee-for-service and other incentive models can encourage the implementation of cognitive pharmaceutical services and strengthen pharmacists' professional engagement in patient-centred care (16,17). Without alignment between professional expectations and financial structures, expanding pharmacists' clinical roles may remain difficult to sustain.

The expansion of pharmacy practice and these operational challenges are accompanied by growing expectations of pharmacists to address the wider environmental consequences of medicine use (18). The accumulation and improper disposal of unused or expired medicines represent important pathways through which pharmaceutical residues enter the environment (19), and extend beyond individual patient care to the interconnected health of human populations, animals, and ecosystems (20). Accordingly, pharmacists can support more sustainable healthcare through responsible medicine use, safe disposal, and effective stock management (18,21). These responsibilities may increase pharmacists' workload and place additional demands on community pharmacies (22). In Croatia, for example, pharmacies were required to cover the costs of disposing of returned medicines without reimbursement, highlighting the need for adequate support and clear responsibilities (23). Integrating this role into routine practice should be accompanied by clear legislation defining pharmacists' responsibilities, accessible collection systems, appropriate financing for handling returned medicines, sustained public engagement, and stronger inclusion of environmental sustainability in pharmacy education and continuing professional development (18,22,24).

Perhaps the most significant force currently transforming pharmacy practice is artificial intelligence (AI). The Organisation for Economic Co-operation and Development (OECD) has argued that AI will fundamentally reshape professional roles across healthcare, requiring new governance and accountability structures (25). Seen through a sociological lens, these developments can be interpreted in light of Abbott's theory of professions, which proposes that technological innovation continually reorganises professional jurisdictions and redistributes authority among occupations (26). Moreover, Timmermans and Berg similarly have argued that medical technologies simultaneously

standardise clinical practice and redistribute professional authority by redefining what constitutes legitimate knowledge within healthcare (27).

The WHO emphasises that AI should support, rather than replace, human clinical judgement. At the same time, it acknowledges that AI raises important ethical and social concerns, including algorithmic bias, accountability, patient autonomy, digital surveillance, and the governance and ownership of health data (28).

Within this context, pharmacists may evolve from primarily knowledge providers to supervisors of AI-supported decision-making and translators of complex technological outputs into patient-centred communication. Automation may reduce routine cognitive tasks while simultaneously increasing the importance of professional judgement, ethical reasoning, contextual interpretation, and interpersonal communication. Preparing future pharmacists, therefore, requires competencies that extend beyond pharmacotherapy to include digital literacy, critical evaluation of AI systems, ethical decision-making, and communication skills that sustain patient trust in technology-assisted healthcare.

Taken together, these developments demonstrate that the future of pharmacy cannot be understood solely through pharmacotherapy knowledge. Pharmacy is fundamentally a socially embedded profession whose effectiveness depends upon interactions between professional identity, organizational culture, structural inequalities, workflow design, social and environmental responsibility, and technological innovation. Greater integration of these perspectives into pharmacy education, research, workforce planning, and policy development would therefore provide a more comprehensive framework for understanding and improving contemporary pharmacy practice and for preparing the profession to meet future healthcare challenges in an increasingly patient-centred and digital world.

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